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TREE FELLING JACKS

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Figure 1 - Jack cylinders inserted in the back of a tree

ABSTRACT

LIRO was recently involved in a trial to evaluate a set of tree jacks designed by Linton Hydraulics, North Shore, Auckland. The trial indicates that the Linton designed jacks have superior safety and durability features than previous models available for logging application. Felling methods have been further developed, improving the level

of safety while directionally felling heavily leaning trees against their predominant lean.

INTRODUCTION

Felling of heavily leaning edge trees adjacent to waterways, roads, native reserves or farm edges has been typically done by line pulling with either a hauler, skidder or tractor. Tree

jacks allow the fallers to continue felling independently of the extraction machine, thus minimising the amount of unproductive time the machine would spend aiding the faller. Tree jacks also allow trees to be felled against their predominant lean in places inaccessible or prohibited to machinery, such as riparian strips adjacent to waterways.

LIRO was recently involved in a trial to evaluate a set of tree jacks designed by "Linton Hydraulics North Shore", the master parts and service agents for "Enerpac". Logging trainers and LIRO researchers also trialled a new felling method, to develop safer felling methods further using jacks to fall heavily leaning trees against their predominant lean.

ACKNOWLEDGEMENTS

LIRO acknowledges Ray Packer (trainer) and the Forestry Corporation of New Zealand Limited, Waiotapu for their assistance with this trial.

EQUIPMENT DESCRIPTION

The complete set consists of two jacks, hose and pump. The back plate of the pump doubles as a "back pack" frame, so once all the components are strapped on, they can be carried distances with relative ease.

Jack capacity	
2 x 25 tonne cylinders	- 50 tonnes
Collapsed height	- 280 mm
Extended height	- 382 mm
Total weight	- 24 kg

The top and bottom plates of the jack cylinders tilt in two directions and have four protruding lugs as non-slip features. While the tree is being jacked over the angle between back cuts increase, the tilting action allows the lugs to remain firmly lodged into the tree. This reduces the chance of the jack

exploding out of the side of the tree when under extreme pressure.

The jack cylinders are fitted with non-return valves. If a hose is cut whilst jacking over a tree, the jack cylinder will retain its pressure and there is no risk of the tree sitting back. Often one jack is all that is required when felling light leaning or small diameter trees. If one jack proves to be inadequate, the second cylinder can be attached, doubling the lifting capacity. The non-return valve prevents the cylinder pressures from equalising, hence the tree can not sit back. The gauge indicator allows for fractional tree movement to be monitored by the jack operator.

The jack cylinder is fitted with a stop ring. This prevents the plunger from popping out of the housing when the ram is fully extended. The jacking hose is a special flexi-jacking hose rated to American jacking standard, 10000 PSI /700 bar working pressure and 20000 PSI /1400 bar burst pressure.

RESULTS

A time study was conducted felling 20 edge trees using the newly developed felling method. The learning curve was only three trees. Felling time using one jack was on average five minutes per tree. Heavier leaning trees where two jacks were needed, felling time was on average 11 minutes per tree. Back lean of the trees ranged from 2° to 6°.

DISCUSSION

It must be emphasised that tree jacking is a specialised job and is not to be carried out by fallers not suitably experienced/qualified. The faller must have a very high standard of skills and a good understanding of tree/falling variables, for example, the effects



Figure 2 - Saw operator completing split level cuts

of different wind conditions, butt defects, stems heavily branched to one side or malforms. These extreme variables make it impossible for LIRO to state that a x diameter tree * y amount of back lean can be safely felled with any method of "cutting up". This must be a judgement call by the faller. However, our trials indicate as a general rule, trees with a back lean greater than 5° to 6° should not be attempted, as there is not enough travel in the jack "ram" to lift the tree to the point where it directionally falls on its own. Trees must always be felled directly against their predominant lean.

Although trees can be "cut up" and jacked over by one person, this method is not recommended. A second person should always be present to act as the jack operator and observer.

Our trials confirmed that, when using the described felling method, small to medium sized trees can, and should be felled by putting the scarf in first and back cuts last.

Felling Procedure - Two Jack Cylinders

- (1) Remove small scarf, one-eighth to one-quarter of the tree diameter to determine the direction of fall (Figure 5, step 1).
- (2) Carefully cut out two blocks from the back of the tree so the jack cylinders can be inserted. Remove as small a block as possible, measure the width and height of the jack cylinder and mark the chain saw bar as a guide to how deep to cut, alternatively use a stick. It is critical when making the horizontal cuts you do not cut more than necessary, as a sufficient width piece of holding wood must remain between the jack cylinders to prevent the tree from sitting back. The bottom horizontal cut is part of the final back cut, step it up from the scarf an extra 5cm than normal felling procedure (Figure 5, Step 2 and 3).
- (3) Insert the jacks, check that all four lugs protruding from the top and bottom plates are going to firmly in-bed into white wood and not into bark. The top and bottom plates only tilt in two directions so check that the jack cylinders are facing the correct way. Pump the jack cylinders up to approximately one-third maximum pressure (Figures 3 and 4).
- (4) "Bore cut" to release the remaining holding wood between the jack cylinders. Make this cut slightly lower than the jack cylinder base plate to ensure not hitting the jack cylinder with the chainsaw chain. Bore through beyond the jack cylinder, or to the determined hinge width, do not undercut the jack cylinders. The jack operator must hold the hoses up, out of the way to prevent them from being cut (Figure 3, Figure 5, step 4)

- (5) Make the second bore cut at the same level as the first, removing excess holding wood and determining the hinge width; do not under cut the jacks (Figure 4, Figure 5, step 5)
- (6) Repeat step 5 on the opposite side of the tree.

The "cutting up" procedure is complete (Figure 4, Figure 5 step 5).

If the saw starts to jam during the "cutting up" procedure (step 4, 5, 6), increase the jack pressure until the saw cuts freely.

- (7) The chainsaw operator should stand clear watching the top of the tree for movement, the jack operator pumps the pressure up watching the gauge accessing the tree for movement. Both the chainsaw and jack operators should work in close liaison until the tree has been directionally felled to the ground.

Felling Procedure - One Jack Cylinder

Alternatively light leaning or small diameter trees may be felled with one jack cylinder. Follow the same principles, except only remove one piece from the back of the tree for inserting the jack cylinder into Figure 5, cut out piece 2 or 3. Depending on the size of the tree "split level" or "quarter cut" methods can be used to remove the excess holding wood.

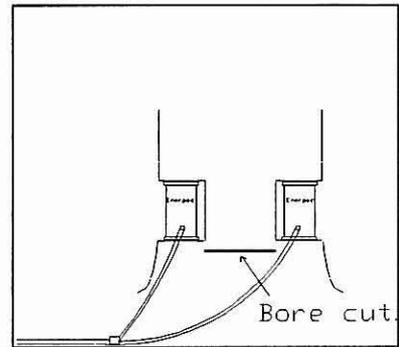


Figure 3 - Back view

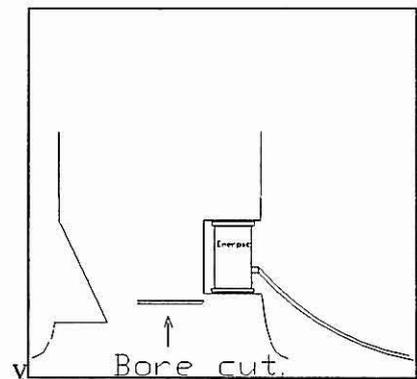


Figure 4 - Side view

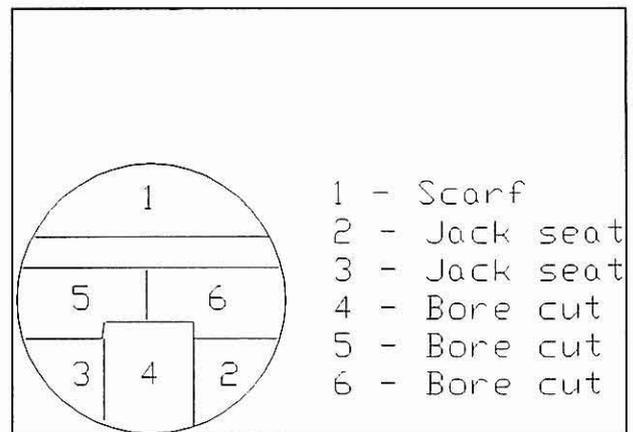


Figure 5 - "Cutting up" procedure

CONCLUSIONS

Tree jacks allow the fallers to continue felling independently of the extraction machine thus mimimising the amount of unproductive time the machine would spend aiding the faller.

Jacks allow trees to be felled against their predominant lean in places inaccessible or prohibited to machinery, such as riparian strips adjacent to waterways.

LIRO's trial indicates that the "Linton" jacks have superior safety and durability features than previous tree jacks available for logging application (Donovan and Gaskin, 1980 and Adams, 1993).

Small to medium sized trees can, and should be, "cut up" by putting the scarf in first and the back cuts last.

The "cutting up" method described in this report sounds complicated at first, but a skilled faller can master the procedure within the first few trees.

Average felling time using two jacks was 11 minutes per tree. Average felling time using one jack was five minutes per tree. Every tree was safely, directionally felled to the ground.

Tree jacking is a specialised job and should only be done by appropriately skilled fallers. The faller must have a very high standard of skills and a good understanding of tree/crosscutting variables.

Trees with a back lean greater than 6° should not be attempted with this model of Linton tree jack as there is not enough travel in the jack "ram" to lift the tree to the point where it directionally falls on its own.

Trees must always be felled against their predominant lean.

REFERENCES

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